REMARKS

Entry of the foregoing amendments and favorable consideration of the subject application is respectfully requested in view of the following comments.

Claims 1 and 2 are currently pending. Claim 1 has been amended in response to the outstanding official action to positively recite the thermally sensitive recording layer as consisting of a colorless or pale colored basic colorless dye and an organic color developing agent as main components, and specific sensitizer and stabilizer compounds. Thus, the claim now identifies the specific sensitizer compound of the present invention in combination with the other elements of the thermally sensitive recording layer and claims 1 and 2 are herewith represented for the examiner's consideration.

With regard to claim 1, the sensitizer compound is now restricted to the specific compound di(p-chlorobenzyl)oxalic acid represented by formula (1) where R_1 is a chlorine atom. This limitation is supported by the disclosure of the published application at paragraph 15 on page 2, which states "[A]s a specific example of the compound represented by general formula (1) … in particular, among these compounds, di(p-chlorobenzyl)oxalate is desirable." and by Example 1 of the specification. Claim 1 was previously amended to restrict the stabilizer to the compound of 3-{[(phenylamino)carbonyl]amino}benzenesulfoneamide represented

by formula (2). This amendment is also supported by Example 1 of the specification which also identifies the thermally sensitive recording layer as containing a dye and a color developing agent.

Accordingly, the composition of claim 1 requires both the sensitizer consisting of di(p-chlorobenzyl)oxalic acid and the stabilizer consisting of 3-{[(phenylamino)carbonyl]amino}-benzenesulfoneamide to be present in the thermally sensitive recording layer of the thermally sensitive recording medium.

Applicants respectfully submit that no new matter has been added by the foregoing amendments and that they are properly enterable at this time.

Rejection of Claims 1 and 2 Under 35 U.S.C. 103(a)

Claims 1 and 2 have been rejected under 35 U.S.C. 103(a) as unpatentable over Minami, et al., U.S. 5,733,843 in view of Yoshihiro, et al., JP 04-164685. The Official Action states:

> "Minami et al. teach a thermally sensitive recording medium comprising a thermally sensitive recording layer which can contain a color former, a color developer of applicants' formula (4), a stabilizer of applicants' formula (2) and di (p-methylbenzyl)oxalic acid as a sensitizer. Yoshihiro et al. teach the equivalence of di (p-methylbenzyl)oxalic acid and di (p-halobenzyl) oxalate as thermally sensitive recording medium sensitizers [see the last two lines in paragraph (1) of enclosed page 557 wherein R is defined]. Given this teaching of equivalence, it would have been obvious to one of ordinary skill in this art to substitute one known sensitizer (e.g., di (p-halobenzyl) oxalate) for another known sensitizer (e.g., di (p-methylbenzyl) oxalic acid) in the absence of unexpected results.

> The fact that applicants' claims do not require an epoxy compound is not dispositive of the issue of patentability since the claims recite the open term 'comprising'. Furthermore, Comparative Examples 5 and 6 are also not dispositive of the issue of patentability since they do not employ both an epoxy compound and the stabilizer of compound (2)."

Applicants respectfully traverse the rejection because the prima *facie case* of obviousness has not been established with respect to claim 1, as amended herein, or claim 2 as dependent from amended claim 1.

The Federal Circuit has ruled that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Feb. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970). A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. See Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

Applicants respectfully submit that a *prima facie* case of obviousness has not been established as there is no convincing line of reasoning which would lead one of ordinary skill in the

art to apply only part of the teachings of Yoshihiro, et al., to Minami, et al. to obtain the thermally sensitive recording medium of the present invention, particularly in view of the unexpected improvements obtained by the specific combination of sensitizer and stabilizer of the present invention as shown by the examples and comparative examples in the present specification.

Although Minami, et al., discloses a thermally sensitive recording medium comprising a thermally sensitive recording layer which can contain a color former, a color developer, a stabilizer of formula (2) and di (p-methylbenzyl) oxalic acid as a sensitizer, the combination of this reference with Yoshihiro, et al., fails to provide a basis for a *prima facie* case of obviousness because the resulting composition is different from that of the presently claimed invention.

Claim 1, as amended herein, recites a thermally sensitive recording medium comprising a thermally sensitive recording layer on a substrate, where the thermally sensitive recording layer consists of a colorless or pale colored basic colorless dye and an organic color developing agent as main components, and specific sensitizer and stabilizer compounds which are specifically identified as di(p-chlorobenzyl)oxalic acid (as the sensitizer) and 3-{[(phenylamino)carbonyl]amino}-benzenesulfoneamide (as the stabilizer). Accordingly, the invention recited in claim 1 and, by dependency, claim 2 is specific to a thermally sensitive recording medium which contains

di(p-chlorobenzyl)oxalic acid as a sensitizer and 3-{[(phenylamino)carbonyl]amino}-benzenesulfoneamide as a stabilizer.

Refering to Minami, et al., at column 8, lines 17-25, Applicants respectfully note that this reference specifically states:

> "Further in this invention, as a sensitizer, it is effective to add aliphatic amide such as amide stearate or amide palmitate, ethylene bisamide, montan wax, polyethylene wax, dibenzyl terephthalate, p-benzylbiphenyl, phenyl α-naphthylcarbonate, 1,4-diethoxynaphthalene, 1-hydroxy-2-phenylnapthoate, 1,2-di-(3-methylphenoxy)ethane, oxalic acid di(p-methylbenzyl), β-benzyloxynapthalene, 4-biphenyl-p-tolylether, o-xylylene-bis-(phenylether), 4-(m-methylphenoxymethyl)biphenyl or the like."

Nowhere does Minami, et al., disclose or suggest the inclusion of di(p-chlorobenzyl)oxalic acid, as a sensitizer in combination with 3-{[(phenylamino)carbonyl]-amino}benzenesulfonamide as a stabilizer so as to obtain the specific composition of claim 1. At best, Minami, et al., discloses that di(p-methylbenzyl) oxalic acid may be used as a sensitizer. However, Applicants respectfully submit that this is a different compound from the di(p-chlorobenzyl)oxalic acid specified in the present claims.

Absent some teaching in Minami, et al., to suggest the utility of di(p-chlorobenzyl)oxalic acid in combination with 3-{[(phenylamino)carbonyl]-amino}benzenesulfonamide as a stabilizer, Applicants respectfully submit that there is no motivation to modify Minami, et al., to use sensitizers other

than those specifically disclosed in the reference.

Considering the teaching of Minami, et al., Applicants note that the object of the present invention is to provide a thermally sensitive recording medium having excellent recording sensitivity and heat resistance and providing excellent recorded image preservative stability against plasticizer, water and hot water. This has been accomplished by the thermally sensitive recording medium of claim 1 where a thermally sensitive recording layer consists of a dye, an organic color developing agent, a sensitizer consisting of di(p-chlorobenzyl)oxalic acid and a stabilizer consisting of 3-{[(phenylamino)carbonyl]-amino}benzenesulfonamide. Although di(p-methylbenzyl) oxalic acid may also be used as a sensitizer in such compositions, as taught by Minami, et al., as shown by the examples in the present application, it does not produce the level of improved properties that Applicants obtain with di(p-chlorobenzyl)oxalic acid.

Example 1 of the application corresponds to the present invention as recited in amended claim 1 and Example 3 corresponds to the thermal sensitive recording sheet of Minami, et al., using di(p-methylbenzyl)oxalic acid as the sensitizer. Although the resulting properties are similar, as shown in Table 1, the recording sheet of Minami, et al., exhibits a lower water resistance than that of the present invention. Furthermore, although the heat resistance of a sheet according to Minami, et al., and the present invention are similar, the hot water

resistance of the present invention as represented by Example 1, exhibits a marked and unexpected increase over that of Minami, et al., represented by Example 3, as summarized in Table 2. Furthermore, considering the results for hot water resistance for Examples 4-6 in comparison with Example 1, it becomes clear that the combination of di(p-chlorobenzyl)oxalic acid as the sensitizer and 3-{[(phenylamino)carbonyl]amino}benzenesulfonamide as the stabilizer in the thermally sensitive recording layer results in a thermally sensitive recording medium distinct from that of the prior art and that the unexpected improvement in hot water resistance clearly shows that di(p-chlorobenzyl)oxalic acid and di(p-methylbenzyl)oxalic acid are not equivalent, particularly when combined with 3-{[(phenylamino)carbonyl]amino} benzenesulfonamide in a thermally sensitive recording medium as presently claimed.

With regard to Yoshihiro, et al., Applicants respectfully point out that the reference teaches a thermal recording medium which contains at least one compound having an epoxy group and a compound represented by general formula (I) which corresponds to a dibenzyl oxalate. However, it is not clear from the reference that the general formula (I) includes the di(p-chlorobenzyl) oxalic acid specifically recited in the presently amended claim 1 and required in the Example 1 of the present application. The examiner has merely circled a portion of the Japanese disclosure purporting to define R_1 of the formula (I) to support the

contention in the current Official Action that Yoshihiro, et al., teaches the equivalence of di(p-methylbenzyl)oxalic acid and di(p-halobenzyl)oxalate. Applicants respectfully submit that, absent an English translation of the relevant portion of Yoshihiro, et al., provided by the Office and clearly showing the teaching alleged by the examiner, reliance upon this reference as supporting the present rejection is misplaced.

Even if Yoshihiro, et al., is established as disclosing both di(p-methylbenzyl)oxalic acid and di(p-halobenzyl)oxalate, as pointed out above in connection with Minami, et al., the result of the hot water resistance test as summarized in Table 2 of the present application clearly show an unexpected improvement in hot water resistance of the thermal recording medium of the present invention employing di(p-chlorobenzyl)oxalic acid and 3-{[(phenylamino)carbonyl]amino}benzenesulfonamide over that corresponding to Minami, et al. employing di(p-methylbenzyl)oxalic acid. Absent some suggestion in either Minami, et al., or Yoshihiro, et al, that substitution of di(p-chlorobenzyl)oxalic acid in the composition of Minami, et al., would yield such improvement, there is no motivation to make the substitution or to expect that it would have any significant effect.

In addition, Applicants note that the English abstract of Yoshihiro, et al., identifies dibenzyl oxalate as the preferred compound of formula (I). Example 4 of the present invention uses

dibenzyl oxalate as the sensitizer instead of di(p-chlorobenzyl)oxalic acid of the present invention and, like Minami, et al., exhibits a marked decrease in hot water resistance over Example 1, the composition of claim 1.

Accordingly, Applicants respectfully submit that one of ordinary skill in the art would not be inclined to look to Yoshihiro, et al., for a suggestion of alternative dibenzyl oxalate sensitizers.

This is particularly so as it is noted that Yoshihiro, et al., in the English abstract, specifically requires "at least one kind of a compound having an epoxy group" which is preferably a novolac type epoxy resin, a bisphenol A type epoxy resin and a diphenylsulfonic acid derivative having an epoxy group. Indeed, applicants respectfully submit that this is the principal teaching of the reference, not the dibenzyl oxalates. Inclusion of such an epoxy group compound in the teaching of Minami, et al., changes the resulting thermal recording medium such that it is very clearly a different composition from that of the present invention which does not require or include a compound having an epoxy group.

In addition, as shown in Applicants' Comparative Examples 5 and 6, inclusion of an epoxy group in such compositions adversely affects the properties of the thermal recording medium where the sensitizer is di(p-chlorobenzyl)oxalic acid (Comparative Example 5) or di-(p-methylbenzyl)oxalic acid (Comparative Example 6). As

shown in the printing results of Tables 1 and 2, when compared with Example 1 which corresponds to the thermally sensitive recording medium as recited in the herein amended claims 1 and 2, and with Example 3 which corresponds to Minami, et al., inclusion of the epoxy compound results in deterioration of the recording sensitivity, heat resistance, plasticizer resistance and water resistance.

Since the epoxy is clearly a required element of Yoshihiro, et al., it would be expected that one considering the teachings of that reference to modify Minami, et al., as suggested by the examiner, would include an epoxy in the resulting modification. As shown by the results for Comparative Examples 5 and 6, such inclusion produces inferior results which would discourage one of ordinary skill in the art from considering Yoshihiro, et al., any further. Thus, even if the disclosure of Yoshihiro, et al., is taken as including a di(p-halobenzyl)oxalate, Applicants respectfully submit that Yoshihiro, et al's. requirement of at least one compound having an epoxy group changes the resulting thermal recording medium such that it is a different composition from that of the present invention which has been specifically restricted to not require or include a compound having an epoxy group. Furthermore, the inferior results obtained by applying the complete teaching of Yoshihiro, et al., to Minami, et al., teaches away from such a modification where the desire is to improve the properties of a resulting thermal recording medium.

Finally, nothing in either Minami, et al., or Yoshihiro, et al., leads one to have a reasonable expectation of the improvement in hot water resistance that is exhibited by the present invention. Indeed, if the di(p-methylbenzyl)oxalic acid of Minami, et al., and the di(p-chlorobenzyl)oxalic acid of the present invention were equivalent, as suggested by the examiner, one would expect the hot water resistance of the present invention to be similar to that of Minami, et al., which is not the case.

Conclusion

In conclusion, Applicants note that the object of the present invention is to provide a thermally sensitive recording medium having excellent recording sensitivity and heat resistance of the ground color and which is excellent in recorded image preservation and stability against plasticizer, water or hot water. This is accomplished by a thermally sensitive recording medium comprising a thermally sensitive recording layer and a substrate wherein the thermally sensitive recording layer consists of a dye, a color developer, a sensitizer consisting of a di(p-chlorobenzyl)oxalic acid and a stabilizer consisting of 3-{[(phenylamino)carbonyl]amino}benzenesulfonamide. This specific combination of sensitizer and stabilizer produces unexpected improvement in the properties of the thermally sensitive recording medium which is not exhibited by using the sensitizer or the stabilizer alone as shown by the results of Comparative

Example 1, in which only the recited stabilizer is present, and Comparative Example 2, in which only the recited sensitizer is used, in comparison with Example 1 in which the combination of the specified sensitizer and stabilizer is used. These results are clearly shown in the Tables of the present application where, in the case of Comparative Example 1, water resistance of the medium is insufficient and hot water resistance and plasticizer resistance of the image are bad. In Comparative Example 2, hot water resistance of the recorded image and ground color are bad as is the plasticizer resistance.

Where the recited stabilizer is used with commonly known sensitizers other than the recited di(p-chlorobenzyl)oxalic acid, as in Comparative Examples 3 and 4, the resulting properties of water resistance and hot water resistance of the recorded image and hot water resistance of the ground color are bad when compared to the present invention. Similarly, when a compound having an epoxy group, such as disclosed by Yoshihiro, et al, is used with the recited sensitizer, as in Comparative Examples 5 and 6, where 4-benzyloxy-4-(2,3-epoxy-2-methylpropoxy) diphenylsulfone is used as the stabilizer with the sensitizer of the present invention, there is a deterioration in the properties of water resistance and hot water resistance as discussed previously.

It is therefore clear from the comparison of the Example 1 with Comparative Examples 1-6, as summarized in Table 3 of the

present invention, that there is an unexpected synergistic effect when the stabilizer 3-{[(phenylamino)carbonyl]amino}-benzenesulfonamide is combined with the sensitizer di(p-chlorobenzyl)oxalic acid in a thermally sensitive recording medium and that this synergistic effect is neither disclosed nor suggested by the prior art.

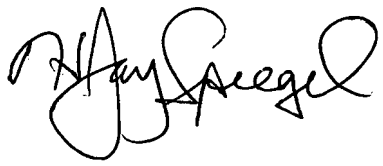
This unexpected synergistic effect is evident even when the thermally sensitive recording medium of the present invention is compared with similar compositions using other dibenzyl oxalates as shown by the comparison of the hot water resistance summarized in Table 2. Thus, the thermally sensitive recording medium of the present invention as recited in claim 1 which corresponds to Example 1 exhibits an unexpected improvement in the hot water resistance even over that of Example 3 which corresponds to the thermal sensitive recording sheet of the reference to Minami, et al.

Accordingly, Applicants respectfully submit that the amendments to the claims presented herein reciting a thermally sensitive recording medium comprising a thermally sensitive recording layer on a substrate where the thermally sensitive recording layer consist of a colorless or pale colored basic colorless dye and an organic color developing agent as main components, a sensitizer consisting of di(p-chlorobenzyl)oxalic acid of formula (1) and a stabilizer consisting of 3-{[(phenylamino)carbonyl]amino}benzenesulfonamide of formula (2)

is not obvious over the prior art of record and withdrawal of the present rejection is respectfully requested.

An early notice of allowance is respectfully requested.

Respectfully submitted,



Attorney for Applicants
H. Jay Spiegel
Reg. No. 30,722

H. JAY SPIEGEL & ASSOCIATES
P.O. Box 11
Mount Vernon, VA 22121
(703) 619-0101 - Phone
(703) 619-0110 - Facsimile
jayspiegel@aol.com - e-mail